MICROSCAN.

Vision HAWK Smart Camera Guide

83-016800-02 Rev D

Disclaimer

The information and specifications described in this manual are subject to change without notice.

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Contents

Welcome!

Purpose of This Manual

This manual contains detailed information about the Vision HAWK Smart Camera.

Manual Conventions

The following typographical conventions are used throughout this manual.

- Items emphasizing important information are **bolded**.

- Menu selections, menu items and entries in screen images are indicated as: Run (triggered), Modify..., etc.

Preface

1

Introduction

FIGURE 1–1. **Vision HAWK Smart Camera, C-Mount and Standard Models**

Product Summary

The Vision HAWK Smart Camera is a compact industrial smart camera that provides powerful machine vision capabilities with a small form factor and intuitive software interface. The Vision HAWK is designed for industrial environments where IP65/67 enclosure and rugged M12 connectivity are required.

Fully-integrated I/O and communications make the Vision HAWK easy to incorporate in virtually any machine vision application. Patented liquid lens autofocus and modular optical zoom enables the Vision HAWK to inspect objects at distances from 33 mm to 2 m and beyond.

Pressing the AutoVISION button at the back of the Vision HAWK enables real time dynamic autofocus. When an object is centered in the field of view and the AutoVISION button is pressed, the camera automatically adjusts focal distance and sets internal parameters to optimize image captures.

AutoVISION software, designed for use with the Vision HAWK, provides an intuitive interface, step-by-step configuration, and a library of presets that allow easy setup and deployment. For more complex vision applications, the system can be upgraded from AutoVISION to Visionscape.

Features and Benefits

- Both Standard and C-Mount versions available

- World's first vision system with liquid lens autofocus (standard models)

- Integrated lighting (standard models)

- Integrated Ethernet

- Flexible programming options for custom applications

- AutoVISION button for automatic targeting, calibration, and triggering

- Simplified configuration with AutoVISION software

- Fully scalable with Visionscape

- Applications can be ported to Visionscape PC-based machine vision

Introduction

Applications

- Automotive assembly verification

- Part identification

- Label positioning

- Contents verification

- Electronics assembly verification and identification

- Semiconductor packaging and component inspection

- Auto ID (Data Matrix and other 2D symbologies, 1D, OCR)

Package Contents

Before you install AutoVISION software and connect your Vision HAWK Smart Camera, please take a moment to confirm that the following items are available:

- Vision HAWK Smart Camera — Your package contains one of the available models listed in Table 1–1

- AutoVISION Software Installation USB Drive

- Required accessories such as a power supply or power cable

Vision HAWK Smart Camera Models

Table 1–1 lists and describes the Vision HAWK Smart Camera models.

TABLE 1–1. Vision HAWK Smart Camera Models

Part Number	Vision HAWK Smart Camera Model
GMV-6800-1000G	Vision HAWK, SXGA, AutoVISION, C-Mount
GMV-6800-1002G	Vision HAWK, SXGA, AutoVISION + Visionscape, C-Mount
GMV-6800-1010G	Vision HAWK, WVGA, AutoVISION, C-Mount
GMV-6800-1012G	Vision HAWK, WVGA, AutoVISION + Visionscape, C-Mount
GMV-6800-1110G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 15° Lens
GMV-6800-1210G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 30° Lens
GMV-6800-1310G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 45° Lens
GMV-6800-1112G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 15° Lens
GMV-6800-1212G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 30° Lens
GMV-6800-1312G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 45° Lens
GMV-6800-1100G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 15° Lens
GMV-6800-1200G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 30° Lens
GMV-6800-1300G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 45° Lens
GMV-6800-1102G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 15° Lens
GMV-6800-1202G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 30° Lens
GMV-6800-1302G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 45° Lens

Part Number Structure

GMV	6800						
General Machine Vision	Vision HAWK	**Comm**	**Lens**	**Sensor**	**Options**	**RoHS**	**Custom**
		1 = Ethernet	0 = C-Mount	0 = CCD (SXGA)	0 = AutoVISION	G = RoHS compliant	0 to 99
			1 = 15° Optics	1 = CMOS (WVGA)	1 = Custom		
			2 = 30° Optics		2 = Visionscape		
			3 = 45° Optics		3 = Custom + Visionscape		

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CHAPTER 2 System Components

This section contains information about system components as well as information to help you connect the Vision HAWK Smart Camera. Specific information describes connectors, adapters, cables, pinouts, and signals.

Note: There are no user-serviceable parts inside.

Hardware Components

Table 2-1 lists Vision HAWK Smart Camera hardware components.

TABLE 2–1. Vision HAWK Smart Camera Hardware Components

Part Number	Description
Cameras	
GMV-6800-1000G	Vision HAWK, SXGA, AutoVISION, C-Mount
GMV-6800-1002G	Vision HAWK, SXGA, AutoVISION + Visionscape, C-Mount
GMV-6800-1010G	Vision HAWK, WVGA, AutoVISION, C-Mount
GMV-6800-1012G	Vision HAWK, WVGA, AutoVISION + Visionscape, C-Mount
GMV-6800-1110G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 15° Lens
GMV-6800-1210G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 30° Lens
GMV-6800-1310G	Vision HAWK, WVGA, Built-In Light, AutoVISION, 45° Lens
GMV-6800-1112G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 15° Lens
GMV-6800-1212G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 30° Lens
GMV-6800-1312G	Vision HAWK, WVGA, Built-In Light, AutoVISION + Visionscape, 45° Lens

TABLE 2–1. Vision HAWK Smart Camera Hardware Components (Continued)

Part Number	Description
GMV-6800-1100G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 15° Lens
GMV-6800-1200G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 30° Lens
GMV-6800-1300G	Vision HAWK, SXGA, Built-In Light, AutoVISION, 45° Lens
GMV-6800-1102G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 15° Lens
GMV-6800-1202G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 30° Lens
GMV-6800-1302G	Vision HAWK, SXGA, Built-In Light, AutoVISION + Visionscape, 45° Lens
Demo Kit	
98-000215-01	Demo Kit (Power Supply, Camera Stand, Ethernet Host Cable, Carrying Case, Documentation)
Power Supplies	
97-000003-01	Power Supply, M12 12-pin Socket, 1.3 m
97-000003-02	Power Supply, M12 12 pin Plug, 1.3m
Communication Devices and Cables	
98-000103-01	QX-1 Interface Device
61-000148-01	Cordset, Common, M12 12 Pin, Socket (Ultralock) to M12 12 Pin, Plug (Ultralock), 3M
61-000148-02	Cordset, Common, M12 12 Pin, Socket (Screw-on) to M12 12 Pin Plug (Screw-on), 3M
61-000162-01	Cordset, Common, M12 12 Pin, Socket (Ultralock) to M12 12 Pin, Plug (Ultralock), 1M
61-000162-02	Cordset, Common, M12 12 Pin, Socket (Screw-on) to M12 12 Pin Plug (Screw-on), 1M
61-000153-01	Cordset, Host, Serial, M12 12 Pin Socket (Ultralock) to DB9 Socket, 1M
61-000153-02	Cordset, Host, Serial M12 12 pin Socket (Screw-on) to DB9 Socket, 1M
61-000164-01	Cordset, Host, Serial, M12 12 pin Socket (Ultralock) to DB9 Socket, 3M
61-000164-02	Cordset, Host, Serial, M12 12 pin Socket (Screw-on) to DB9 Socket, 3M
61-000152-01	Cordset, Host, Serial M12 12 pin Plug (Ultralock) to DB9 Socket, 1M
61-000152-02	Cordset, Host, Serial, M12 12 pin Plug (Screw-down) to DB9 Socket, 1M
61-000165-01	Cordset, Host, Serial M12 12 pin Plug (Ultralock) to DB9 Socket, 3M
61-000165-02	Cordset, Host, Serial M12 12 pin Plug (Screw-on) to DB9 Socket, 3M
61-000163-01	Cordset, Host, Ethernet, M12 8 pin Plug (Ultralock) to RJ45, 3M
61-000163-02	Cordset, Host, Ethernet, M12 8 pin Plug(Screw-on) to RJ45, 3M
61-000160-01	Cordset, Host, Ethernet, M12 8 pin Plug (Ultralock) to RJ45, 1M
61-000160-02	Cordset, Host, Ethernet, M12 8 pin Plug (Screw-on) to RJ45, 1M
61-000161-01	Cordset, M12 12 pin Plug (Ultralock) to MS-5100, 3M
61-000161-02	Cordset, M12 12 pin Plug (Screw-on) to MS-5100, 3M
61-000172-01	Cordset, M12 12 pin Plug (Ultralock) to M12 12 pin Socket (Ultralock) to DB25 Plug
61-000158-03	Cordset, M12 12 Pin Plug & Socket (Ultralock) to MS-Connect 210, RS-232, 2M
61-000158-04	Cordset, M12 12 Pin Plug & Socket (Ultralock) to MS-Connect 210, RS-422/485, 2M
61-000166-01	Cordset, M12 12 Pin Plug (Ultralock) to Flying Leads, 3M
61-000166-02	Cordset, M12 12 Pin Plug (Screw-on) to Flying Leads, 3M

TABLE 2–1. Vision HAWK Smart Camera Hardware Components (Continued)

Part Number	Description
61-000167-01	Cordset, M12 12 Pin Socket (Ultralock) to Flying Leads, 3M
61-000167-02	Cordset, M12 12 Pin Socket (Screw-on) to Flying Leads, 3M
61-000207-01	Cordset, C-Mount-to-Smart Series Light
FIS-0210-0001G	MS-Connect 210, Connectivity Box with Display
FIS-0210-0002G	MS-Connect 210, Connectivity Box
FIS-0210-0003G	MS-Connect 210, Connectivity Box with Display and Ethernet
FIS-0210-0004G	MS-Connect 210, Connectivity Box with Ethernet
98-000013-04	Relay Module, 120VAC, 3 Amp Output, Series 70, Type SM, for MS-Connect 210
98-000013-05	Relay Module, 240VAC, 3 Amp Output, Series 70, Type SM for MS-Connect 210
98-000013-06	Relay Module, 24VDC, 3 Amp Output, Series 70, Type SM for MS-Connect 210
Accessories	
98-000143-01	Adapter Plate Kit
98-000148-01	L-Bracket Kit
98-000144-01	Right Angle Mirror Kit
98-000146-01	Window Replacement Kit
98-000147-01	15° Lens Kit
98-000147-02	30° Lens Kit
98-000147-03	45° Lens Kit
98-000205-01	Glass WIndow Kit with Infrared (IR) Filter
98-000206-01	Glass Window Kit
98-500006-01	Mounting Plate Kit, Flat, Custom Surfaces
20-610024-01	Trigger Connector, 4-pin Plug (screw terminal and field-wireable) (for self-wiring)
98-000037-01	Extension Kit, All Cameras, 6 inch
98-000054-01	Kit, Mounting Stand Base Plate, Small
98-000016-01	Mounting Arm/Adapter Kit, 6 inch
99-000056-01	Accessory, Bracket, DOAL 50 to Vision HAWK
99-000058-01	Accessory, Bracket, DOAL 75 to Vision HAWK
99-000060-01	Accessory, Bracket, DOAL 100 to Vision HAWK
99-000061-01	Accessory, Bracket, DOAL to C-MOUNT Vision HAWK
99-000050-01	Accessory, Bracket,R-100 to Vision HAWK
99-000052-01	Accessory, Bracket,R-60/70 to Vision HAWK
99-000049-01	Accessory, Bracket,R-100 to C-MOUNT Vision HAWK
99-000051-01	Accessory, Bracket,R-60/70 to C-MOUNT Vision HAWK
98-92800471	5MM Extension Tube for C-Mount Lenses
98-CO206	Lens Extension Tube Set 0.5, 1, 5, 10, 20, 40mm
98-92800571	Lens 8mm F/1.4-16, FT 25.5mm P 0.5mm, 2/3" C-MNT

TABLE 2–1. Vision HAWK Smart Camera Hardware Components (Continued)

Part Number	Description
98-92800572	Lens 12mm F/1.8-16, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800573	Lens 16mm F/1.4-16, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800574	Lens 25mm F/1.6-16, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800575	Lens 35mm F/2.1-22, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800576	Lens 50mm F/2.8-22, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800577	Lens 75mm F/3.9-32, FT 25.5mm P 0.5mm, 2/3" C-MNT
98-92800311	Lens, Skylight UV Filter 25.5mm Thread
98-92800371	Polarizing Filter 25.5mm Thread
98-000218-01	Lens Protection Housing, Standard Length (up to 48mm)
98-000226-01	Lens Protection Housing, Long (up to 72mm)
Object Detectors	
99-000020-01	Photo Sensor, M12 4pin Plug, NPN, Dark Off, 2m
99-000020-02	Photo Sensor, M12 4-pin Plug, NPN, Dark On, 2 m
Documentation	
37-000010-01	Microscan Tools Drive (Software, User's Manuals, Quick Start Guides, Configuration Guides, links to other documents on Microscan website

Note: Additional hardware components are available in the Microscan Product Pricing Catalog.

Standard Vision HAWK Front

Figure 2-1 shows the front of the Vision HAWK Smart Camera.

FIGURE 2–1. Front
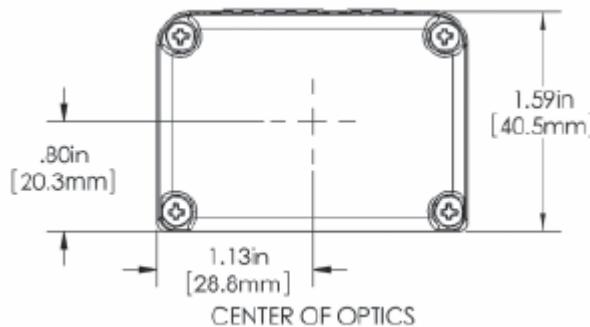
Standard Vision HAWK Base

Figure 2–2 shows the base of the Vision HAWK Smart Camera.

FIGURE 2–2. Base
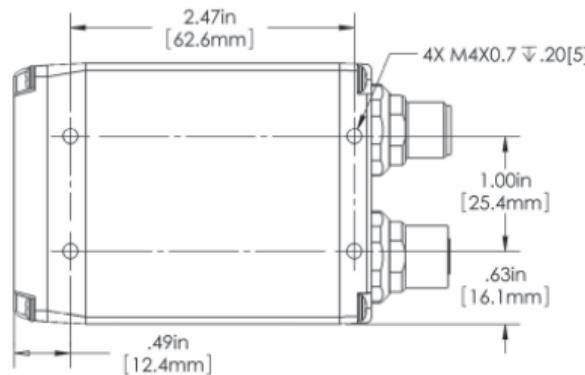
Standard Vision HAWK Side

Figure 2-3 shows the side of the Vision HAWK Smart Camera.

FIGURE 2–3. Side
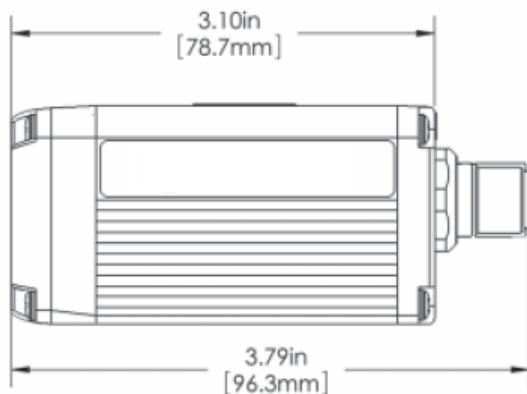

Standard Vision HAWK Back

Figure 2-4 shows the back of the Vision HAWK Smart Camera.

FIGURE 2–4. Back
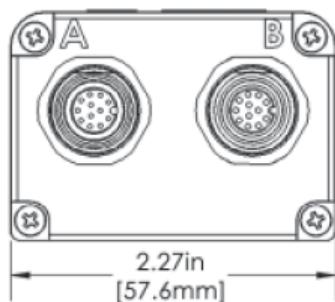
Vision HAWK C-Mount Front

Figure 2-5 shows the front of the Vision HAWK C-Mount Smart Camera.

FIGURE 2–5. Front
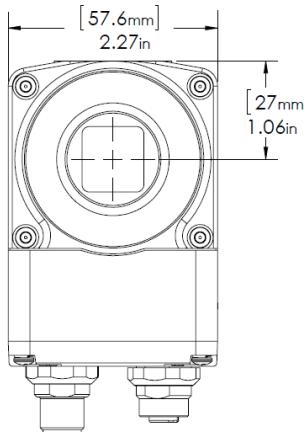
Vision HAWK C-Mount Base

Figure 2–6 shows the top of the Vision HAWK C-Mount Smart Camera.

FIGURE 2–6. Top
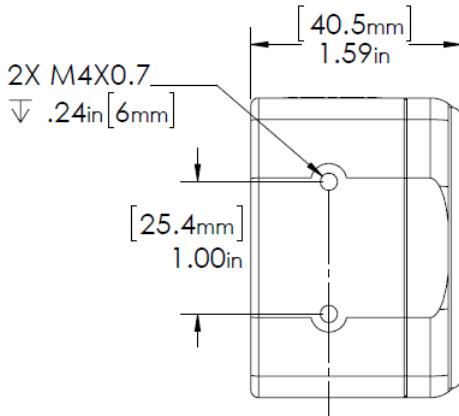
Vision HAWK C-Mount Side

Figure 2-7 shows the side of the Vision HAWK C-Mount Smart Camera.

FIGURE 2–7. Side
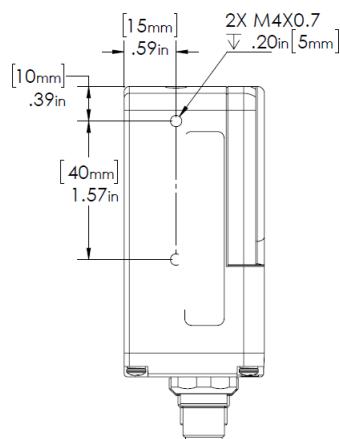
Vision HAWK C-Mount Back

Figure 2-8 shows the back of the Vision HAWK C-Mount Smart Camera.

FIGURE 2–8. Back
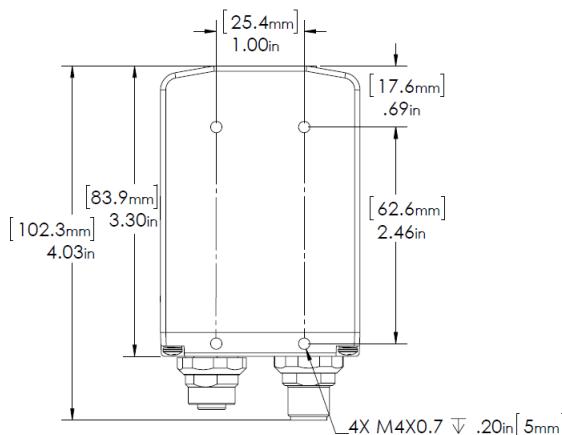
Important Label Information

Each Vision HAWK Smart Camera has its own label, which contains important information about that camera.

- P/N – The Microscan part number of your Vision HAWK Smart Camera.
- S/N — The serial number of your Vision HAWK Smart Camera.
- MAC — The MAC address of your Vision HAWK Smart Camera.

2

System Components

Mounting and Wiring the Vision HAWK Smart Camera

- Mount the camera (**1**) securely as required by the application.

Mounting holes
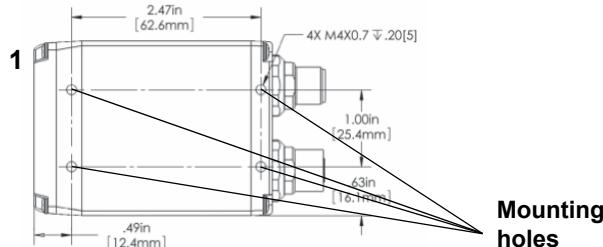
- Connect the Ethernet cable (**2**) from "B" on the camera (**1**) to the network.
- Connect the power supply cable (**3**) to "3" on the QX-1 (**4**).
- Connect the trigger (**5**) to "T" on the QX-1 (**4**).
- Connect the "Common" cable (**6**) from "A" on the camera (**1**) to "2" on the QX-1 (**4**).
- Plug in the power supply (**3**).
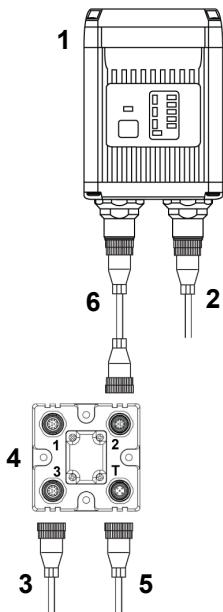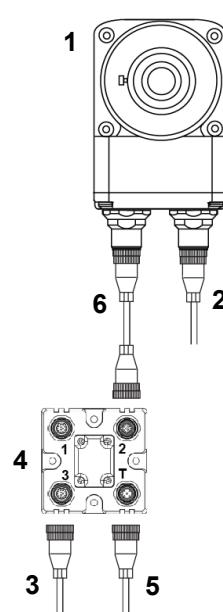
Standard Vision HAWK   *Vision HAWK C-Mount*

Optoisolated Outputs

The reader has optoisolated outputs that can transfer signals from the camera to peripherals. Outputs can be configured as either NPN or PNP, but NPN and PNP cannot be mixed in a system, because the output common is shared by all outputs.

NPN Output for Host Input

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System Components
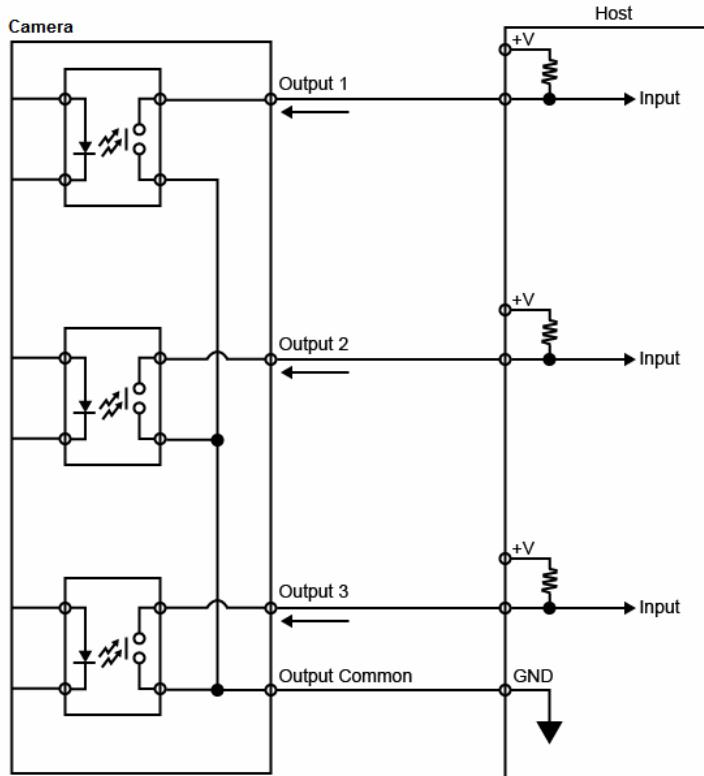
NPN Output for External Load
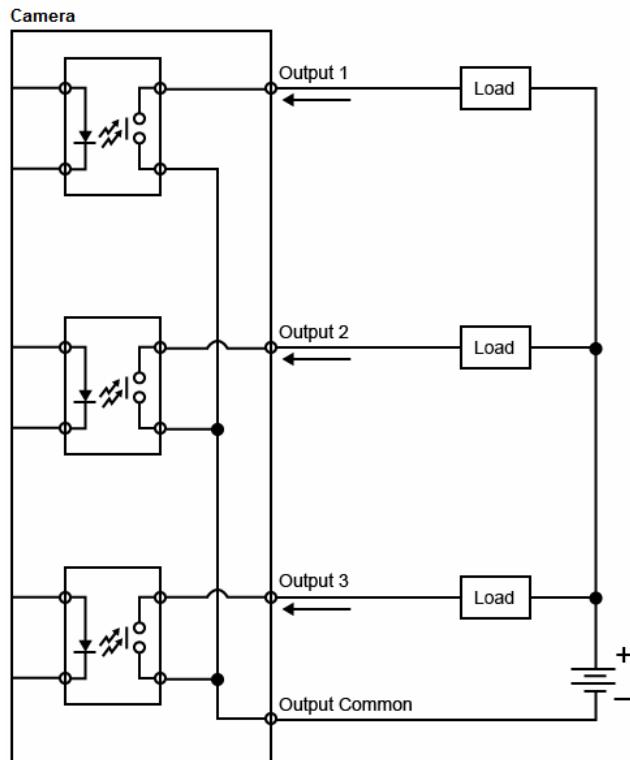
PNP Output for Host Input
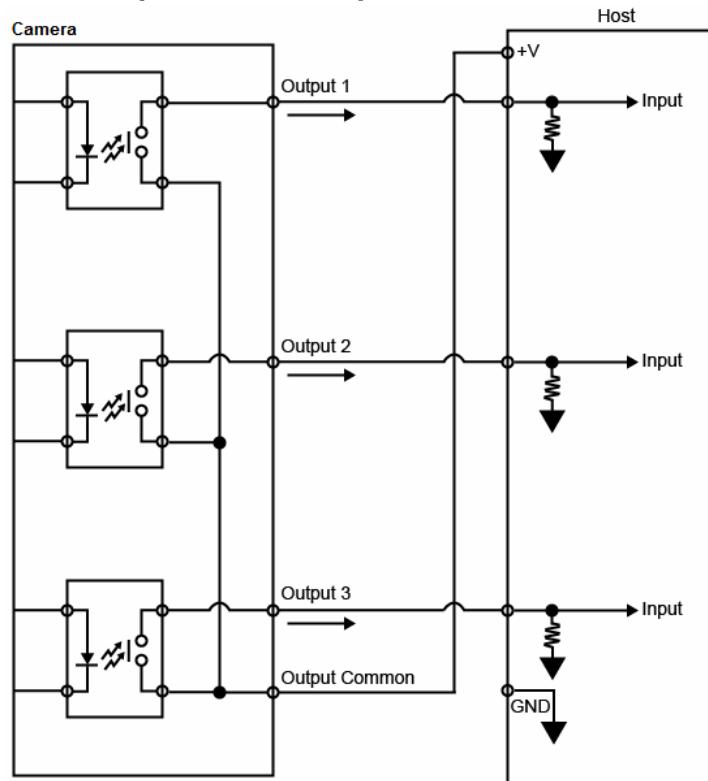
PNP Output for External Load
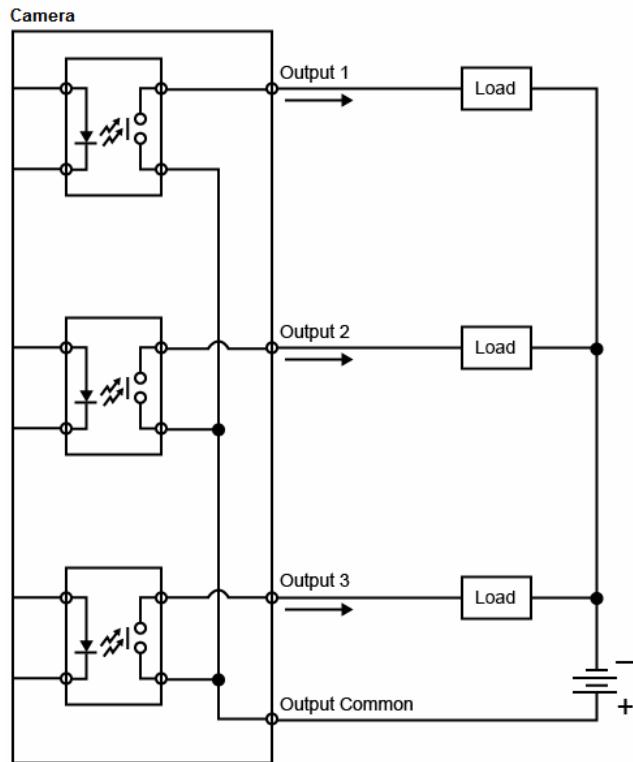
Optoisolated Inputs

All discrete inputs are optoisolated. Inputs can be configured as either NPN or PNP, but NPN and PNP cannot be mixed in a system, because the input common is shared by all inputs.

NPN

CLC = Current Limiting Circuit

PNP

CLC = Current Limiting Circuit

Input/Output Wiring

Diagram: M12 12-pin plug flying lead cordset — Terminal Strip — PLC

M12 12-pin plug flying lead cordset	Wire Color	PLC
Output 1 Pin 5	Gray	PASS/FAIL
Output 2 Pin 11	Gray/Pink	DATA READY
Output 3 Pin 6	Pink	OPTIONAL
24V+ Pin 2	Brown	24V+
Input Common Pin 8	Red	
Input 1 Pin 4	Yellow	Input
Output Common Pin 12	Blue/Red	
Ground Pin 7	Blue	
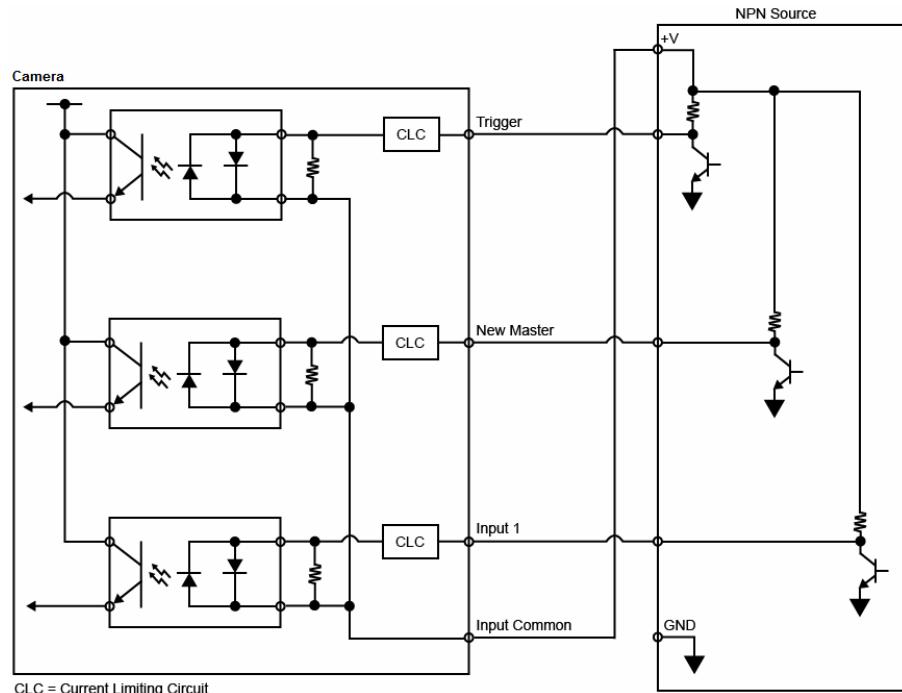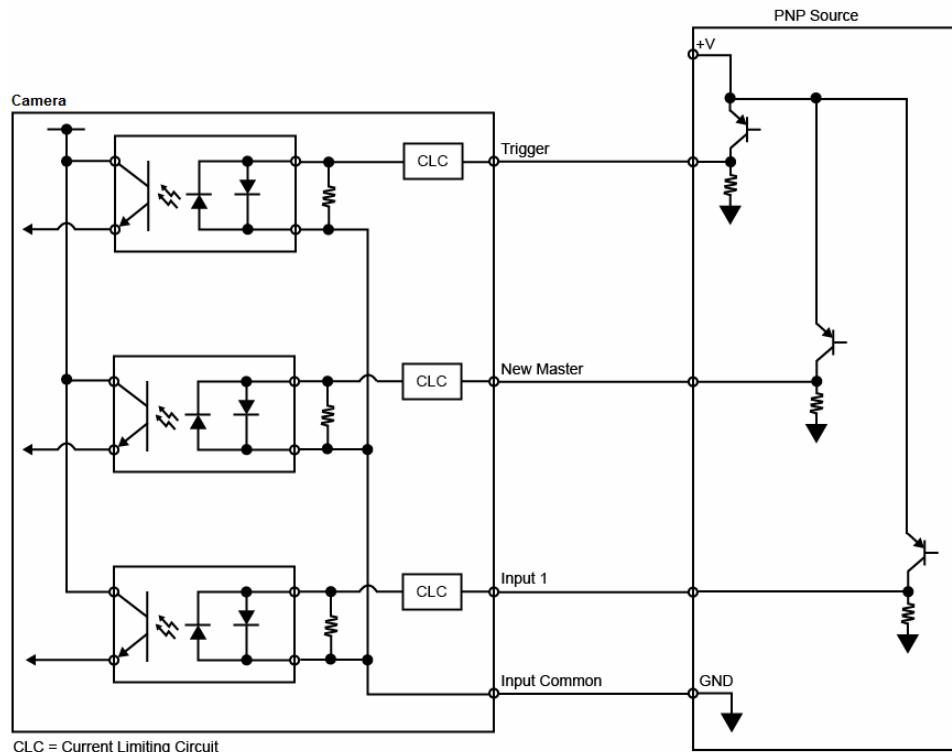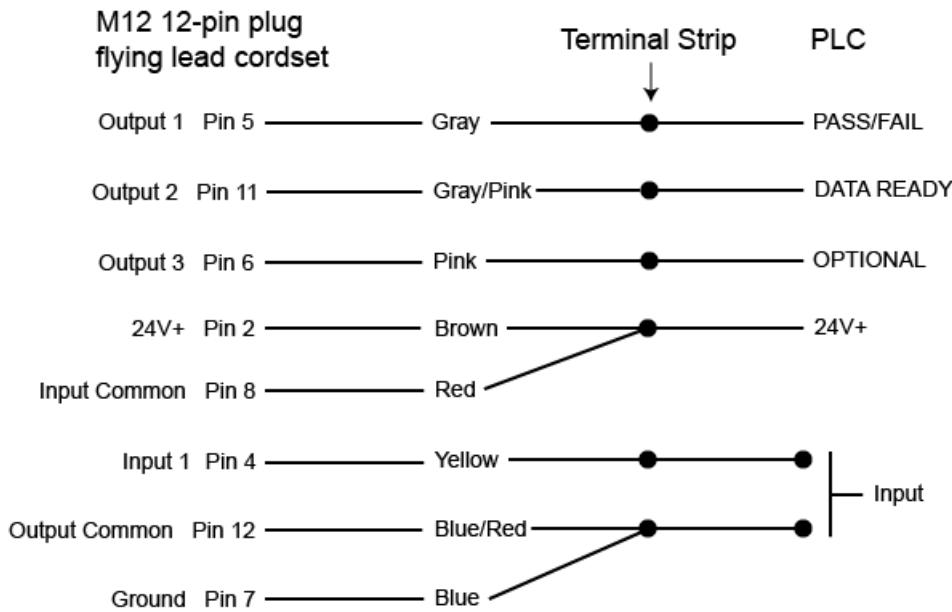
Power Requirements

Refer to Table 2-3 when determining the power supply requirements for your camera.

TABLE 2–3. Camera Power Requirements

Component	
Vision HAWK Smart Camera, CCD	5-28VDC, 200mV p-p max ripple, 170mA at 24VDC (typ.) 15.5 watts (max.)
Vision HAWK Smart Camera, CMOS	5-28VDC, 200mV p-p max ripple, 135mA at 24VDC (typ.) 13 watts (max.)
Vision HAWK C-Mount Smart Camera, CCD	5-28VDC, 200mV p-p max ripple, 130mA at 24VDC (typ.) 15.5 watts (max.)
Vision HAWK C-Mount Smart Camera, CMOS	5-28VDC, 200mV p-p max ripple, 105mA at 24VDC (typ.) 13 watts (max.)

Status Indicators

The top of the Vision HAWK Smart Camera has multiple LEDs that indicate different trigger, inspection, camera, communication, and power states.

TRIG = Trigger Status

PASS/FAIL = Inspection Status

MODE = Camera Status

LINK/ACT = Link Activity Status

Outputs 1, 2, 3
Power Status
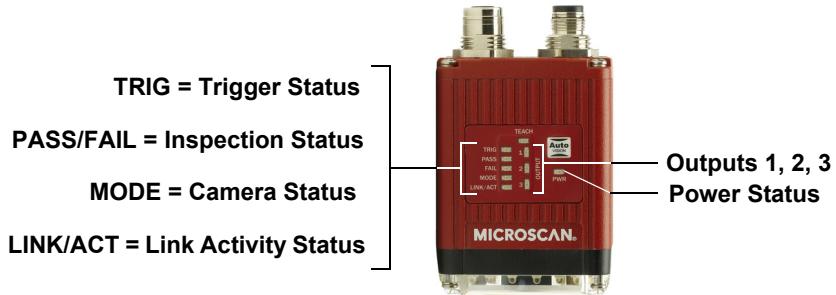
| TRIG	On Steady	Continuous Trigger
	Off	Waiting for Trigger Event
	On Flashing	Trigger Event
PASS/FAIL	On	Active State
	Off	Inactive State
MODE	On Steady	Unit Ready
	Off	Unit Not Ready
LINK/ACT	On Steady	Link Established
	Off	No Link/Activity
	On Flashing	Link Established and Activity on Link
PWR	On	Power On
	Off	No Power Applied to Unit
OUTPUTS	On	Signal Sent to External Output
	Off	No Signal Sent to External Output

Additional User Feedback

- Green Flash – A green flash from the front of the unit indicates a Good Read.
- Red X Targeting Pattern – The red X targeting pattern from the front of the unit allows the user to center an object in the camera's field of view.
- Beeper – The beeper is an audible verification that either a Pass or a Fail has occurred.

2

System Components

AutoVISION Button

The AutoVISION Button has two positions, selectable by the length of time the button is held down, and indicated by one or two beeps in succession. It can also be used to send a trigger signal when **Send Trigger** is checked in AutoVISION software's **Connect** view. When the trigger functionality is enabled, pushing the AutoVISION Button triggers the camera to capture an image.

Auto Button	☑ Enable Auto Button
	☑ Send Trigger

1st Position: Red Targeting Pattern

The first AutoVISION Button position turns the targeting system on. This overrides any other targeting modes that have been configured.

2nd Position: Auto Calibration

The second AutoVISION Button position starts the Auto Calibration process, which selects the appropriate photometry and focus settings for the camera. The selected values are then saved for power-on.

Setting Up a Job in AutoVISION

2

System Components

AutoVISION is a critical component of the Vision HAWK's functionality. Designed for use with the Vision HAWK, AutoVISION provides an intuitive interface, step-by-step configuration, and a library of presets that allow easy setup and deployment. For more complex vision applications, the system can be upgraded from AutoVISION to Visionscape.

1. Configure Vision HAWK hardware.
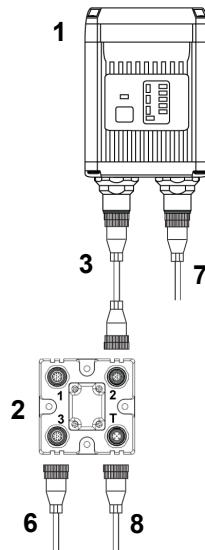
See Appendix A, **Connector Pinouts**, for Vision HAWK pin assignments.

Item	Description	Part Number
1	Vision HAWK Smart Camera	GMV-6800-XXXXG
2	QX-1 Interface Device	98-000103-02
3	Cordset, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m	61-000162-01
4	Cordset, Host, Serial, M12 12-pin Plug to DB9, 1 m	61-000152-01
5	Cordset, Host, Serial, M12 12-pin Socket to DB9, 1 m	61-000153-01
6	Power Supply, M12 12-pin Socket, 1.3 m	97-000003-01
7	Cordset, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m	61-000160-01
8	Trigger, M12 4-pin Plug, NPN, Dark On, 2 m	99-000020-02

Note: Additional cables available in the Microscan Product Pricing Catalog.

– Mount the camera as required by the application.
– Connect the Ethernet cable from "B" on the camera to the network.
– Connect the power supply to "3" on the QX-1.
– Connect the photo sensor to "T" on the QX-1.
– Connect the "Common" cable to "2" on the QX-1 and "A" on the camera.
– Plug in the power supply.

2. Select your Vision HAWK in the AutoVISION Connect view, create a job, and adjust camera settings.

AutoVISION's **Connect** view allows you to select your device and configure its settings, and to create a new job. The **Select Device** dropdown menu provides a list of available devices. Hover the mouse over a device to see its details.
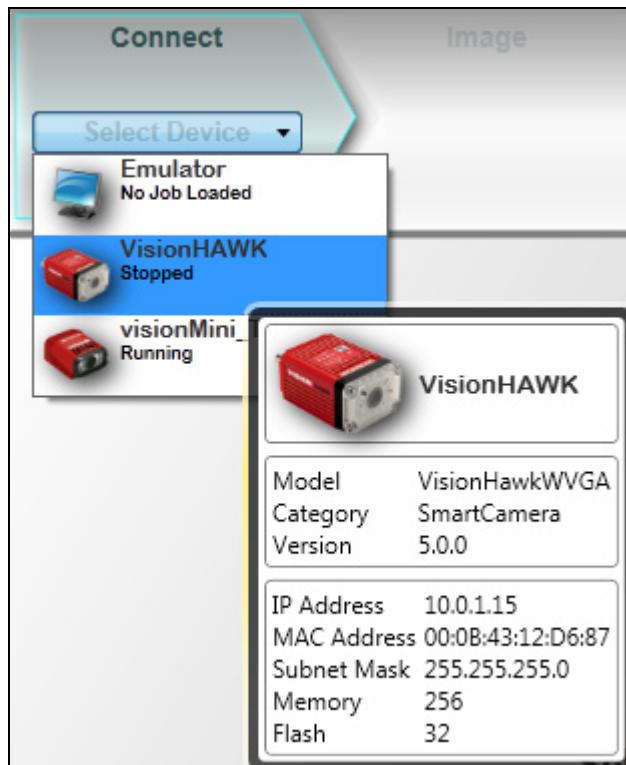
Click the lock icon to take control of the camera. When you have control of the camera, the **Modify** button will appear beneath the camera settings. Click the Modify button to adjust camera settings.

Note: The default IP address of the camera is: **192.168.0.10**. Be sure your PC is on the same subnet (**192.168.0.100**, for example).

No job is loaded

Create a New Job

Load a Job

Upload Job From Device

Modify camera settings in the **Details** area at the left of the **Connect** view.
Create, **Load**, or **Upload** a job using the buttons in the center of the **Connect** view.
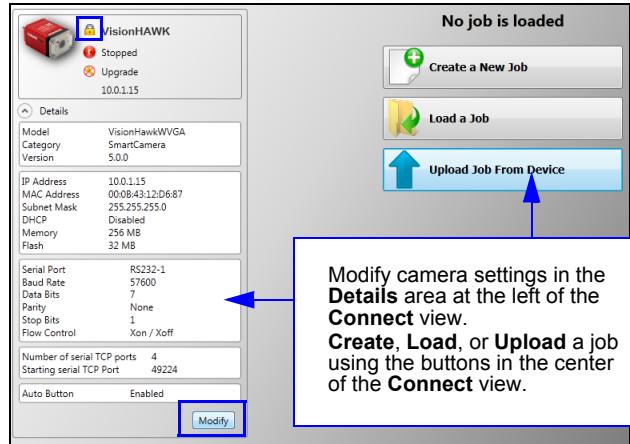
Important: When modifying camera settings, you will need to enter a username and password for the camera. The default username and password are:

– **Username:** Microscan
– **Password:** vision

Once you have selected your camera, adjusted its settings, and created a new job, you will move to the **Image** view. This view allows you to **Auto Calibrate** the camera, and to manually adjust the camera's Exposure, Gain, and Focus, and also to set the Lighting Mode (On, Off, or Strobe).

3. Edit the Job in AutoVISION.

After you have created a new job, loaded a job from your PC, or uploaded a job from the camera, you will proceed to the Edit view to refine your machine vision job. The Camera parameters below the captured image allow you to set Gain, Exposure, Focus, Trigger, and Lighting. Inspection Outputs options allow you to connect your job to the outside world. This is also the view where you can add multiple tools to the job. The tool icons are located above the main view area.
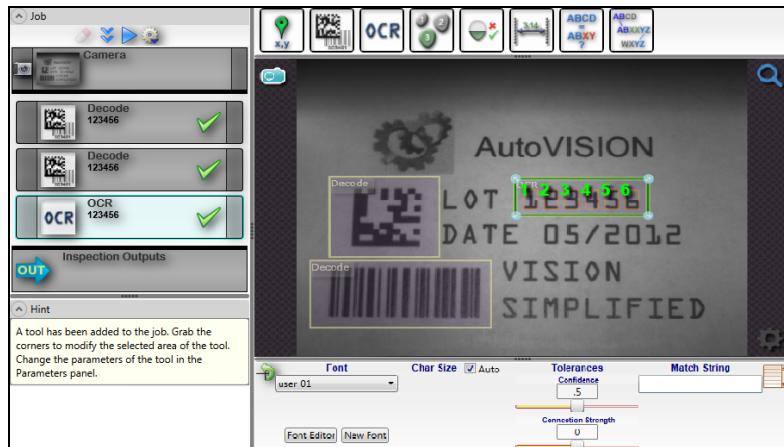
4. Run the Job in AutoVISION.

Going to the **Run** view will automatically download your job to the camera and start it running.

5. Save the Job.

Click the **Save to Camera** icon on the File menu bar to save the job to the Vision HAWK.

Chapter **2** System Components

3

Optics and Lighting

This section describes the optical and illumination characteristics of the Vision HAWK Smart Camera.

3

Optics and Lighting

Optics

The Vision HAWK Smart Camera is available with a built-in CMOS sensor or CCD sensor.

Optics Specifications

Part Number	GMV-6800-1100G	GMV-6800-1200G	GMV-6800-1300G	GMV-6800-1110G	GMV-6800-1210G	GMV-6800-1310G
Sensor	CCD, Global Shutter			CMOS, Global Shutter		
Sensor Color	Monochrome					
Resolution	SXGA (1280 x 960) CCD			WVGA (752 x 480) CMOS		
Focal Range	1" (33 mm) to ∞ (liquid lens autofocus)					
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)			Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)		
Part Number	GMV-6800-1102G	GMV-6800-1202G	GMV-6800-1302G	GMV-6800-1112G	GMV-6800-1212G	GMV-6800-1312G
Sensor	CCD, Global Shutter			CMOS, Global Shutter		
Sensor Color	Monochrome					
Resolution	SXGA (1280 x 960) CCD			WVGA (752 x 480) CMOS		
Focal Range	1" (33 mm) to ∞ (liquid lens autofocus)					
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)			Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)		

Part Number	GMV-6800-1000G	GMV-6800-1002G	GMV-6800-1010G	GMV-6800-1012G
Sensor	CCD, Global Shutter		CMOS, Global Shutter	
Sensor Color	Monochrome			
Resolution	SXGA (1280 x 960) CCD		WVGA (752 x 480) CMOS	
Focal Range	Depends on lens			
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)		Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)	

Illumination

The standard version of the Vision HAWK Smart Camera has built-in lighting (red LEDs for SXGA models and white LEDs for QXGA models). The LEDs can be configured to operate in multiple modes – Continuous, Strobe, and Off.

Lighting Specifications

Part Number	GMV-6800-1100G	GMV-6800-1200G	GMV-6800-1300G	GMV-6800-1110G	GMV-6800-1210G	GMV-6800-1310G
	GMV-6800-1102G	GMV-6800-1202G	GMV-6800-1302G	GMV-6800-1112G	GMV-6800-1212G	GMV-6800-1312G
LED Color	Red @ 617nm					

Important: The Vision HAWK C-Mount (GMV-6800-1000G, GMV-6800-1002G, GMV-6800-1010G, GMV-6800-1012G) does not have built-in lighting. The Machine Vision Lighting Principles on the following page provide some suggestions for how to determine the appropriate external lighting for your application.

3

Optics and Lighting

Machine Vision Lighting Principles

Proper lighting is critical to the success of a machine vision application. Depending on the requirements of your application, you may also need to add external lighting from Microscan's NERLITE family of machine vision lighting products.

Consider the following when setting up your application:

– Is the surface of the object flat, slightly bumpy, or very bumpy?

– Is the surface matte or shiny?

– Is the object curved or flat?

– What is the color of the object or area being inspected?

– Is the object moving or stationary?

Machine vision lighting should maximize contrast of the areas or features being inspected while minimizing the contrast of everything else.
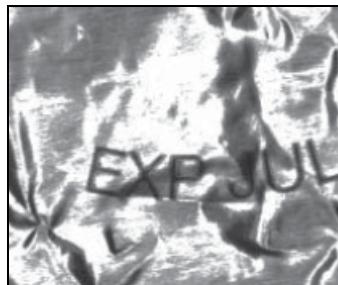

Before correct lighting
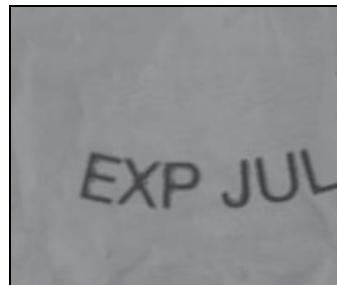
After correct lighting with a NERLITE CDI Illuminator

External Illumination Control

The Vision HAWK C-Mount Smart Camera supports external lighting with Microscan's NERLITE Smart Series lights. The diagram below demonstrates how the camera and light can be configured with two QX-1 interface devices. The light is controlled using the **Lighting** control in the **Camera** configuration settings of AutoVISION software.

The camera's trigger is synchronized with the light to create a strobe effect for reliable image acquisition.

3

Optics and Lighting

Chapter **3** Optics and Lighting

A
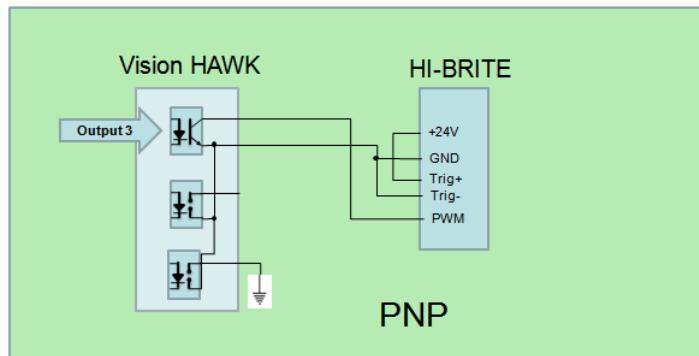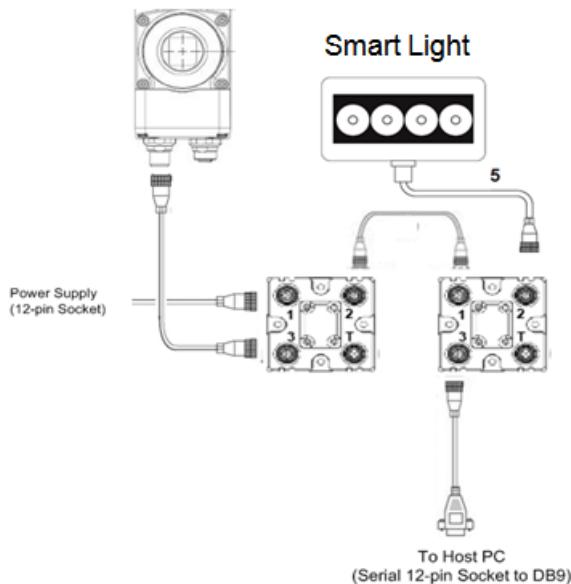
Connector Pinouts

This section contains information about Vision HAWK Smart Camera connectors:

- M12 12-Pin Plug on page A-2

- M12 8-Pin Socket on page A-3

A

Connector Pinouts

Vision HAWK Smart Camera Connectors

Connector A – M12 12-Pin Plug – Power, I/O, and Serial

Figure A–1 shows the M12 12-pin plug at connector A.

FIGURE A–1. Connector A – M12 12-Pin Plug
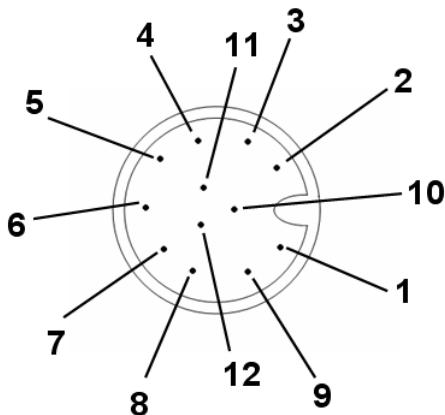
Table A–1 describes the M12 12-pin plug signals.

TABLE A–1. Connector A – M12 12-Pin Plug

Pin	Function
1	Trigger
2	Power
3	Default
4	Input 1
5	Output 1
6	Output 3
7	Ground
8	Input Common
9	Host RxD
10	Host TxD
11	Output 2
12	Output Common

Connector B – M12 8-Pin Socket – Ethernet

Figure A-2 shows the M12 8-pin socket at connector B.

FIGURE A–2. **Connector B – M12 8-Pin Socket**
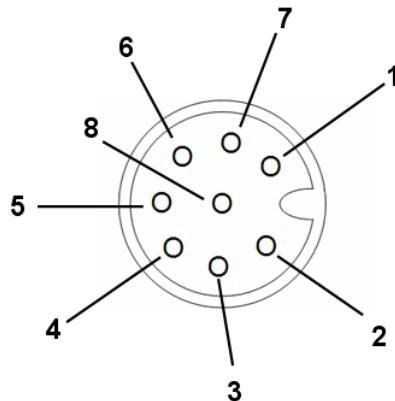
Table A-2 describes the M12 8-pin socket signals.

TABLE A–2. **Connector B – M12 8-Pin Socket**

Pin	Function
1	Terminated
2	Terminated
3	Terminated
4	TX (–)
5	RX (+)
6	TX (+)
7	Terminated
8	RX (–)

A

Connector Pinouts

Appendix A Connector Pinouts

APPENDIX B Cable Specifications

This section contains information about Vision HAWK Smart Camera cables.

Note: Cable specifications are published for information only. Microscan does not guarantee the performance or quality of cables provided by other suppliers.

TABLE B–1. Cable Part Numbers and Descriptions

Part Number	Descriptions
61-000160-01	Cable, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m
61-000162-01	Cable, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m
97-000003-01	Power Supply, M12 12-pin Socket, 1.3 m
99-000020-02	Trigger, M12 4-pin Plug, NPN, Dark On, 2 m

# 61-000160-01 Cable, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m

The 61-000160-01 Cable, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m is a 1 meter cable with an 8-pin M12 Ultra-Lock connector on one end and a standard RJ45 connector on the other end.

Figure B-1 shows the 61-000160-01 Cable, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m.

FIGURE B–1. Cable, Host, Ethernet, M12 8-pin Plug to RJ45, 1 m

M12 8-Pin Plug   RJ45
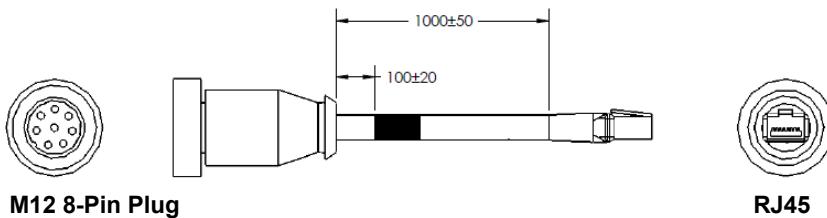
Important: Be sure that the retaining clip on the RJ45 connector has locked into place in the Ethernet receptacle on the PC and is not being impeded by the rubber housing.

Note: A screw-down version of this cable is also available (61-000160-02).

61-000162-01 Cable, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m

The 61-000162-01 Cable, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m is a 1 meter cable with a 12-pin M12 plug on one end and a 12-pin M12 socket on the other end.

Figure B-2 shows the 61-000162-01 Cable, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m.

FIGURE B–2. Cable, Common, M12 12-pin Plug to M12 12-pin Socket, 1 m
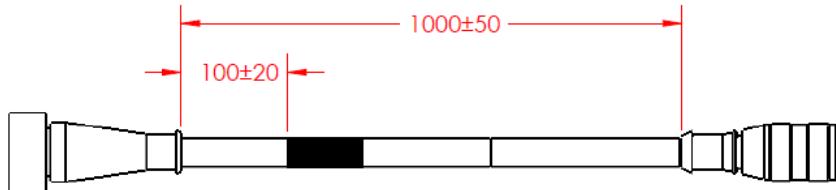
Note: A screw-down version of this cable is also available (61-000162-02).

97-000003-01 Power Supply, M12 12-pin Socket, 1.3 m

The 97-000003-01 Power Supply, M12 12-pin Socket, 1.3 m is a 90-254 VAC, +24VDC power supply.

Figure B-3 shows the 97-000003-01 Power Supply, M12 12-pin Socket, 1.3 m.

FIGURE B–3. **Power Supply, M12 12-pin Socket, 1.3 m**
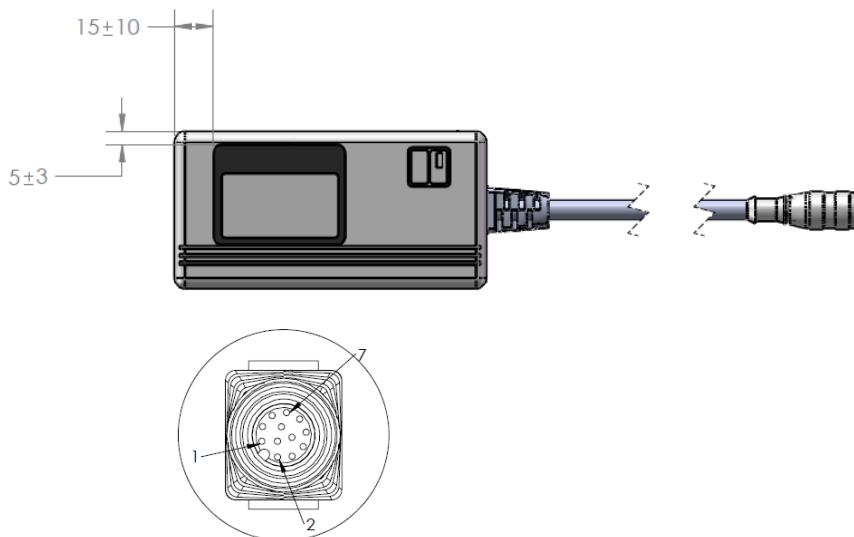
M12 12-Pin Socket

99-000020-02 Trigger, M12 4-pin Plug, NPN, Dark On, 2 m

The 99-000020-02 Trigger, M12 4-pin Plug, NPN, Dark On, 2 m is a photo sensor with a 4-pin M12 connector.

Figure B-4 shows the 99-000020-02 Trigger, M12 4-pin Plug, NPN, Dark On, 2 m.

FIGURE B–4. **Trigger, M12 4-pin Plug, NPN, Dark On, 2 m**
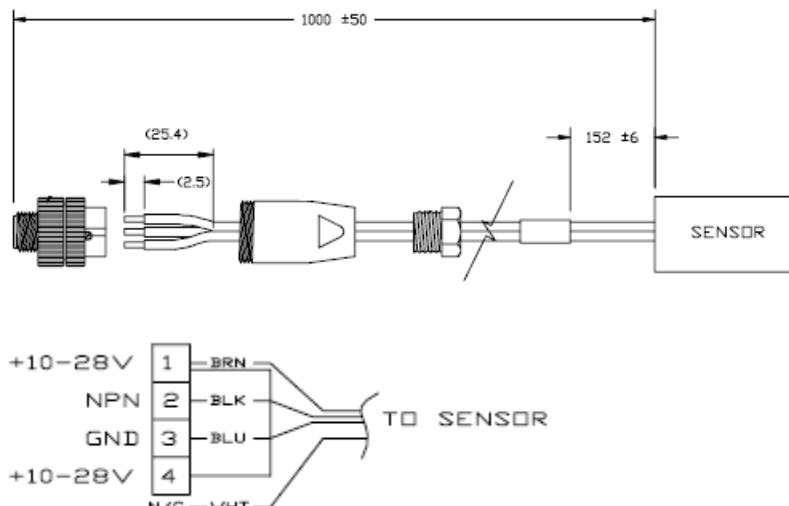
99-000020-02 Schematic

Appendix **B**   Cable Specifications

C

APPENDIX C General Specifications

This section contains specifications and dimensions for the Vision HAWK Smart Camera and Vision HAWK C-Mount Smart Camera.

TABLE C–1. General Specifications

Part Number	GMV-6800-1100G	GMV-6800-1200G	GMV-6800-1300G	GMV-6800-1110G	GMV-6800-1210G	GMV-6800-1310G
Sensor	SXGA (1280 x 960) CCD			WVGA (752 x 480) CMOS		
Sensor Color	Monochrome					
Height	1.59" (40.5 mm)					
Width	2.27" (57.6 mm)					
Depth	3.79" (96.3 mm)					
Weight	10 oz. (280 g)					
Power	5-28VDC, 200mV p-p max ripple, 170mA at 24VDC (typ.), 15.5 watts (max.)			5-28VDC, 200mV p-p max ripple, 135mA at 24VDC (typ.), 13 watts (max.)		
Connector	M12 12-pin Ultra-Lock (Connector A) and M12 8-pin Ultra-Lock (Connector B)					
Lens Type	Built-In Liquid Lens					
Communications	RS-232 or Ethernet					
Illumination	**High Output LEDs:** .564mW, 470, 525, 617nm					
Laser Output	5.0mW max.; **Type:** Laser diode; **Output Wavelength:** 655nm nominal; **Operating Life:** 50,000 hours @ 25° C; **Safety Class:** Class 1 Visible Laser					
Indicators	**LEDs:** Trigger, Pass, Fail, Mode, Power, Network Activity, I/O; **Green Flash:** Pass; **Red X:** Target					
I/O	**Learn/Trigger:** Bi-directional, optoisolated, 4.5–28V rated, (13mA at 24VDC); **Outputs (1, 2, 3):** Bi-directional, optoisolated, 1–28V rated, (I_{CE} <100mA at 24VDC, current limited by user)					

TABLE C–1. **General Specifications (Continued)**

Image Acquisition	Progressive scan, square pixel	
Focal Range	1" (33 mm) to ∞ (liquid lens autofocus)	
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)	Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)
Operating Temperature	0° to 45° C (32° to 118° F)	0° to 50° C (32° to 122° F)
Storage Temperature	–29° to 70° C (–20° to 158° F)	
Humidity	Up to 90% (non-condensing)	
Compliance	**CDRH**, **FCC**, **UL/cUL**, **CE (General Immunity for Light Industry:** EN 55024:1998 ITE Immunity Standard; **Radiated and Conducted Emissions of ITE Equipment:** EN 55022:98 ITE Disturbances), **CB**, **BSMI**	

TABLE C–1. Specifications (Continued)

Part Number	GMV-6800-1102G	GMV-6800-1202G	GMV-6800-1302G	GMV-6800-1112G	GMV-6800-1212G	GMV-6800-1312G
Sensor	SXGA (1280 x 960) CCD			WVGA (752 x 480) CMOS		
Sensor Color	Monochrome					
Height	1.59" (40.5 mm)					
Width	2.27" (57.6 mm)					
Depth	3.79" (96.3 mm)					
Weight	10 oz. (280 g)					
Power	5-28VDC, 200mV p-p max ripple, 170mA at 24VDC (typ.), 15.5 watts (max.)			5-28VDC, 200mV p-p max ripple, 135mA at 24VDC (typ.), 13 watts (max.)		
Connector	M12 12-pin Ultra-Lock (Connector A) and M12 8-pin Ultra-Lock (Connector B)					
Lens Type	Fixed Lens					
Communications	RS-232 or Ethernet					
Illumination	**High Output LEDs:** .564mW, 470, 525, 617nm					
Laser Output	5.0mW max.; **Type:** Laser diode; **Output Wavelength:** 655nm nominal; **Operating Life:** 50,000 hours @ 25° C; **Safety Class:** Class 1 Visible Laser					
Indicators	**LEDs:** Trigger, Pass, Fail, Mode, Power, Network Activity, I/O; **Green Flash:** Pass; **Red X:** Target					
I/O	**Learn/Trigger:** Bi-directional, optoisolated, 4.5–28V rated, (13mA at 24VDC); **Outputs (1, 2, 3):** Bi-directional, optoisolated, 1–28V rated, (I_{CE} <100mA at 24VDC, current limited by user)					
Image Acquisition	Progressive scan, square pixel					
Focal Range	1" (33 mm) to ∞ (liquid lens autofocus)					
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)			Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)		
Operating Temperature	0° to 45° C (32° to 118° F)			0° to 50° C (32° to 122° F)		
Storage Temperature	–29° to 70° C (–20° to 158° F)					
Humidity	Up to 90% (non-condensing)					
Compliance	**CDRH**, **FCC**, **UL/cUL**, **CE (General Immunity for Light Industry:** EN 55024:1998 ITE Immunity Standard; **Radiated and Conducted Emissions of ITE Equipment:** EN 55022:98 ITE Disturbances**)**, **CB**, **BSMI**					

TABLE C–1. Specifications (Continued)

Part Number	GMV-6800-1000G	GMV-6800-1002G	GMV-6800-1010G	GMV-6800-1012G
Sensor	SXGA (1280 x 960) CCD		WVGA (752 x 480) CMOS	
Sensor Color	Monochrome			
Height	4.03" (102.3 mm)			
Width	2.27" (57.6 mm)			
Depth	1.59" (40.5 mm)			
Weight	11 oz. (320 g)			
Power	5-28VDC, 200mV p-p max ripple, 130mA at 24VDC (typ.), 15.5 watts (max.)		5-28VDC, 200mV p-p max ripple, 105mA at 24VDC (typ.), 13 watts (max.)	
Connector	M12 12-pin Ultra-Lock (Connector A) and M12 8-pin Ultra-Lock (Connector B)			
Lens Type	C-Mount Lens			
Communications	RS-232 or Ethernet			
Illumination	External Illumination Required			
Laser Output	N/A			
Indicators	**LEDs:** Trigger, Pass, Fail, Mode, Power, Network Activity, I/O			
I/O	**Learn/Trigger:** Bi-directional, optoisolated, 4.5–28V rated, (13mA at 24VDC); **Outputs (1, 2, 3):** Bi-directional, optoisolated, 1–28V rated, (I_{CE} <100mA at 24VDC, current limited by user)			
Image Acquisition	Progressive scan, square pixel			
Focal Range	Depends on lens			
Shutter	Exposure: 6us to 100ms (1/150,000 to 1/10) Default = 666us (1/1,500)		Exposure: 25us to 100ms (1/40,000 to 1/10) Default = 400us (1/2,500)	
Operating Temperature	0° to 45° C (32° to 118° F)		0° to 50° C (32° to 122° F)	
Storage Temperature	–29° to 70° C (–20° to 158° F)			
Humidity	Up to 90% (non-condensing)			
Compliance	**CDRH**, **FCC**, **UL/cUL**, **CE (General Immunity for Light Industry:** EN 55024:1998 ITE Immunity Standard; **Radiated and Conducted Emissions of ITE Equipment:** EN 55022:98 ITE Disturbances**)**, **CB**, **BSMI**			

Dimensions

FIGURE C–1. Vision HAWK Smart Camera Dimensions

C

**General
Specifications**
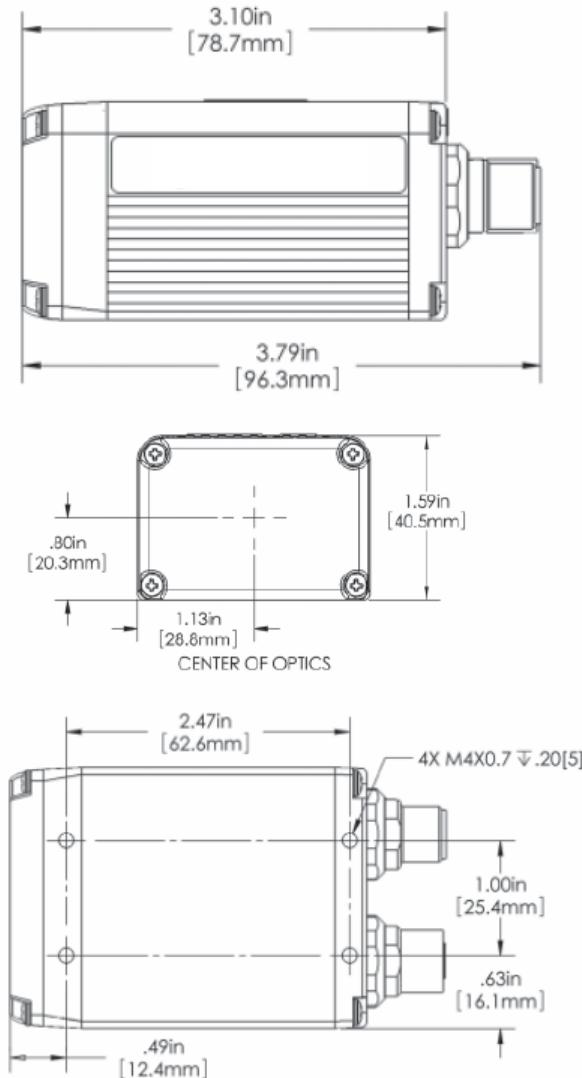
FIGURE C–2. Vision HAWK C-Mount Smart Camera Dimensions
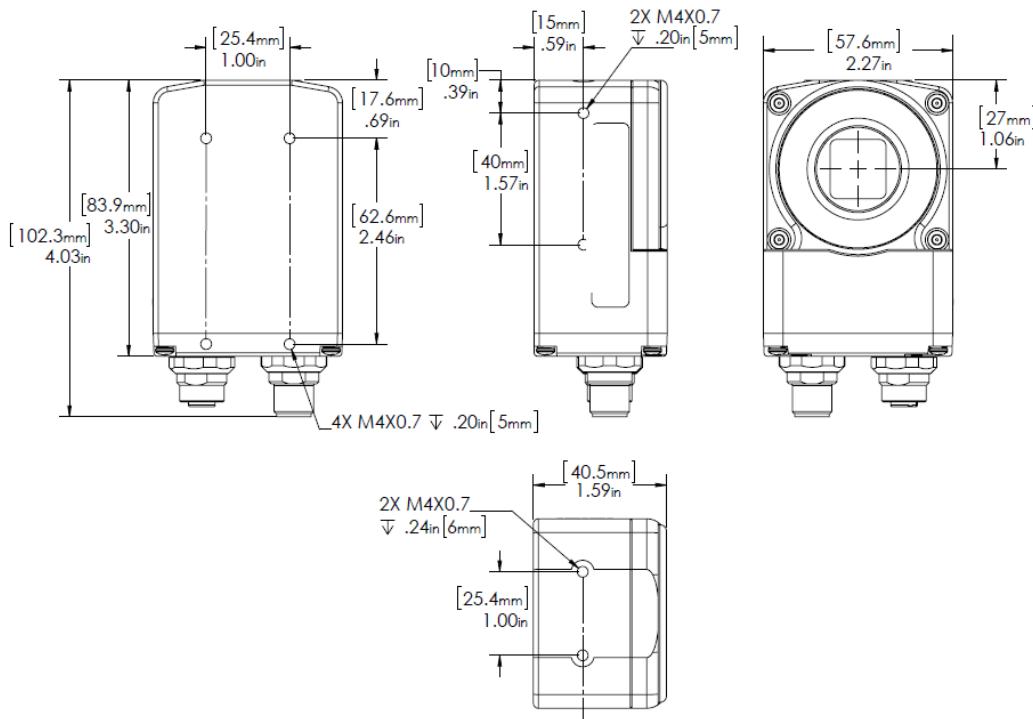
Field of View and Working Distance

Appendix C General Specifications

D

APPENDIX D   Web HMI
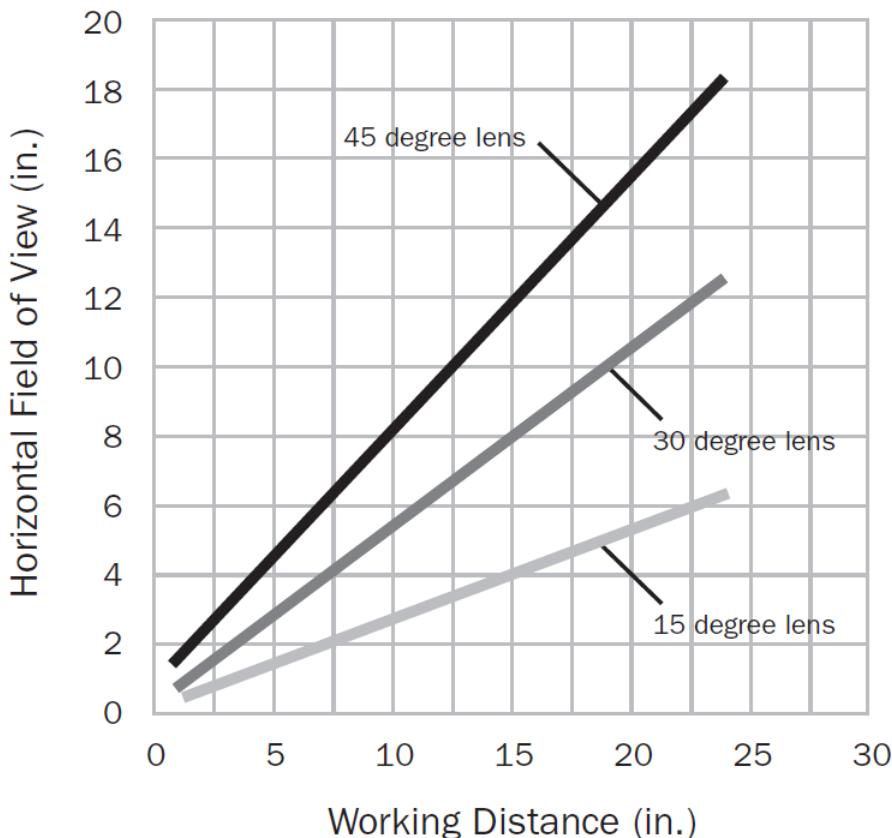
This appendix contains information about Vision HAWK support for Visualization HMIs.The Vision HAWK features a built in runtime monitoring web page that can be viewed from any supported browser on the same network. Supported browsers include:

- Internet Explorer 5.0 or later

- Firefox 3.0 or later

A built-in runtime HTML monitoring page suitable for HMI Panels that support Internet Explorer 5.0 or later browser such as the SIMATIC M277 Panel is available on the Vision HAWK. Note that the runtime page can also be displayed with the Firefox or Safari web browsers.

The Runtime Page shows an image from the Vision HAWK, along with inspection counters and buttons to control certain aspects of the display. A title bar displays the camera name, ip address and resolution. Options are available to change if and where the counters, buttons, and titlebar are displayed. Additionally, up to 10 results values from the job can be displayed along with each image. These values can either be overlayed over the image, or shown as a tabular report underneath the image.

All settings and options are set by the user via a series of option pages which can appear over the main display. All parameters are saved as cookies in the web browser environment, so that the next time the Runtime Page is loaded for that device, the layout and settings are retained.

The Runtime Image Page is accessed via a URL which contains the IP address of the camera, and optional parameters. The default page is accessed by simply specifying the IP address of the camera in a web browser, for example:

http:// 161.218.121.58 (example only, actual IP address of the Vision HAWK should be used)

If no previous settings have been set by the user, the display will be similar to the following:
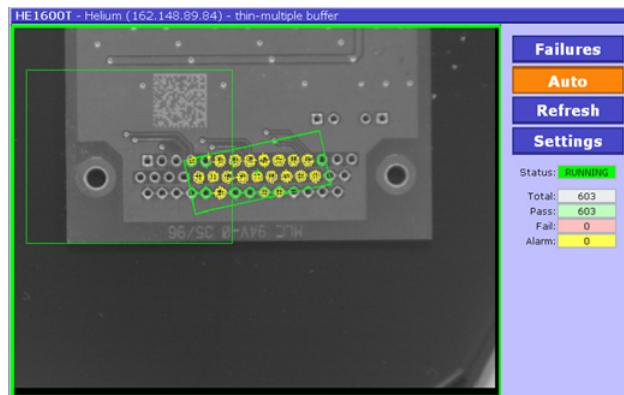
The default behavior is:

- Images and counters are for the first inspection in the job

- All images (pass & fail) are shown

- The display is automatically refreshed at regular intervals (auto=on)

- Graphics are overlaid on the image (note: not all graphics are available)

- A border is drawn around the image signifying the status of the inspection: green=pass, red=fail

The web page includes the following elements:

- **Title Bar** specifying the name of the camera, IP address, and job (avp) filename. Note that the file extension (.avp) is removed from the displayed filename.

  HE1600T - Helium (162.148.89.84) - thin-multiple buffer

- **Failures** Push Button – when this button is selected, only images related to failed inspections are displayed

- **Auto** Push Button – when this button is selected, the image and counters are updated automatically. If the button is not selected, both the image and counters are frozen.

- **Refresh** Push Button – pushing this button manually updates the image and counters

  Failures
  Auto
  Refresh

- **Status** – the run status of the inspection – RUNNING or STOPPED

  Status: STOPPED

- • **Counters** – the Total, Pass, Fail and Alarm counters are shown for the selected inspection

Total:	5311
Pass:	5311
Fail:	0
Alarm:	0

Adding Options to the Base URL

An option can be specified by adding it to the end of the URL as follows:

http://ip_address/?option=value

Note the question mark "?" separating the URL from the optional parameter(s).

Additional options are specified by separating them with the ampersand "&" character.

http://ip_address/?option1=value1&option2=value2&option3=value3

Basic Options

NOTE: Some basic options can be changed by specifying optional values at the end of the URL. A much richer superset of these options can be configured by using the Settings Pages described below. It is possible to completely control the behavior of the Runtime Page without the use of optional parameters in the URL.

The graphics overlay can be turned on or off by using the "graphics" URL option. This is a setting that can have the value "on" or "off". As an example, to turn the display of graphics off, the web page can be launched with the following URL:

http:// 161.218.121.58/?graphics=off

Option Name	Values	Default	Comments
graphics	on, off	on	**on** = graphics are shown overlaid on the image. (note: not all graphics are supported for web page display) **off** = graphics are not shown
type	last, failed	last	**last** = show last image for the selected inspection **failed** = show last failed image for the selected inspection
passfailborder	on, off	on	**on** = show a border around the image **off** = no border displayed

Note: ROI graphics are not produced by applications created by AutoVISION. They are displayed for applications created in Visionscape FrontRunner.

Layout Options

The overall layout of the Runtime Page can be configured. To change the layout, use the Settings screens as described in the next section. The following shows a default configuration:
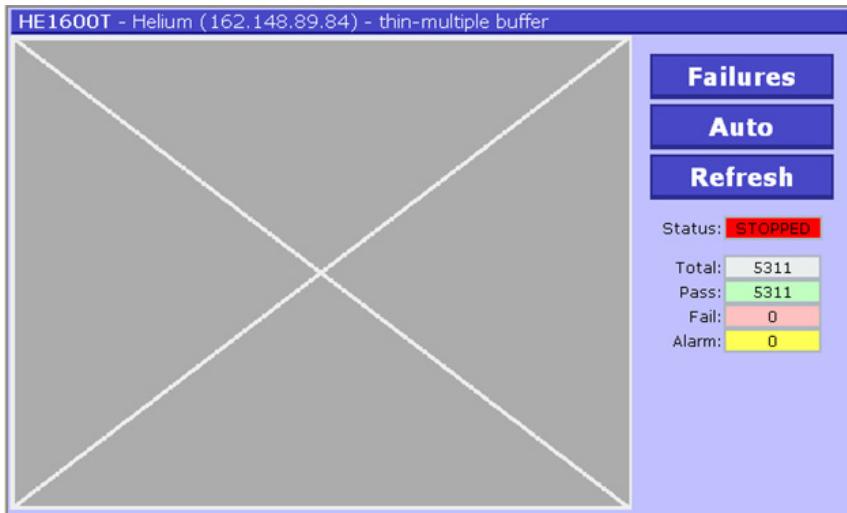
Buttons, status, and counters appear to the right of the image area. The buttons are size for use via a touch screen.

The following illustrates that the layout has been changed to position the counters at the top, shown without titles to save room. Additionally, an Options button now appears in the right side area.

Another example with buttons and counters at the top:
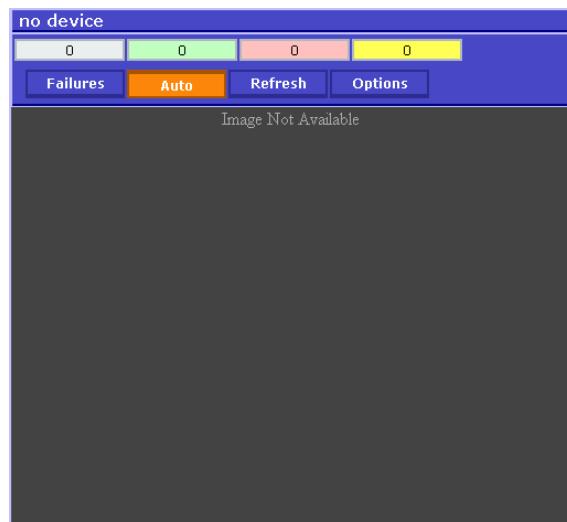
It is also possible to hide all elements except the image.

Settings Pages

All of the options and settings can be configured by using the settings pages. By default, there is no "Settings" button, so to show the settings pages, the URL should be specified with the "setopt=1" parameter as follows:

http://ip_address/?setopt=1

This will display the Runtime Page overlayed with the Options Setup page as follows:
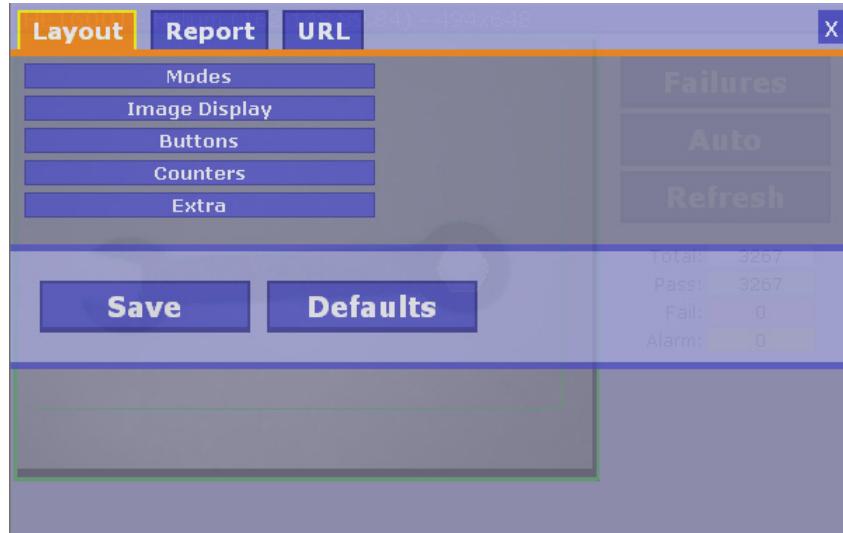
The tabs at the top of the screen can be used to navigate between the several setup pages. To close the setup screens and return to the main display, use the close button ("X") at the upper right corner.

The Layout page controls many layout features, which are organized into groups. Selecting the Modes group results in the following options being displayed:

Refer to the table below for a description of the various settings. The other groups of settings appear as follows:

Image Display:

Buttons:

Counters and Status:
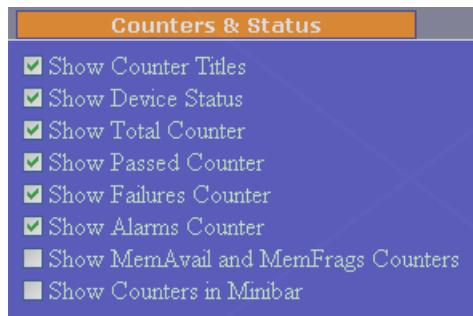
Extra Settings:

As each option is checked or unchecked, the effect can be seen immediately by observing the layout of the Runtime Page shown behind the Options Setup Page.

Option Name	Function	Default
Launch in Auto Mode	Determines if the Runtime Page defaults to be in auto-refresh mode when launched.	On
Launch in Failures Mode	Determines if the Runtime Page defaults to be in show failures mode when launched.	Off
Show Tool Graphics	Shows tool graphics overlayed on the image. (NOTE: not all tool graphics are supported)	On
Show Pass/Fail Border	Shows a border around the image (green = pass, red = fail)	On
Warp Image to Fit Display	Scaling the image to fill the display area can have an adverse effect on the quality of the graphics displayed. As an example, lines can be missing. This setting improves the quality of the displayed graphics. Turning this off will reduce the overhead on the 1600T	On
Fit Image Height Fit Image Width	These two settings determine how the image is scaled to fit the display area. If both are off, then no scaling is performed and the image is displayed 1:1. If both are on, then auto scaling is performed, fitting the width or height depending on which fits the display area better. Otherwise, the image is scaled either to fit the width or height.	Auto (both on)
Show Report	Shows the report configured using the Report Setup page.	On
Show Report in List Format	If on, then the report is shown in tabular form below the image. If off, then the report is overlayed on top of the image.	Off
Show Titlebar	If on, the titlebar is shown	On
Show Buttons in Minibar	If on, the buttons are shown in the Minibar area, which appears under the titlebar. If off, the buttons will be	Off

	shown to the right of the image area.	
Show Counters in Minibar	If on, the counters are shown in the Minibar area, which appears under the titlebar. If off, the counters will be shown to the right of the image area.	Off
Show Auto Button	If on, the Auto button is shown	On
Show Failures Button	If on, the Failures button is shown	On
Show Refresh Button	If on, the Refresh button is shown	On
Show Options Button	If on, the Options button is shown. This button, when pressed, displays the Options Setup screen.	Off
Show Graphics Button	If on, the Graphics button is shown. This button controls if the graphics are overlayed on the image	Off
Show Counter Titles	If on, a title is displayed to the left of each counter.	On
Show Device Status	If on, the device status (RUNNING, STOPPED) is displayed	On
Show Total Counter	If on, the total counter is shown	On
Show Passed Counter	If on, the passed counter is shown	On
Show Failures Counter	If on, the failures counter is shown	On
Show Alarms Counter	If on, the alarms counter is shown	On
Show MemAvail and MemFrags Counters	If on, two counters are shown which display memory use status for the HE1600T.	Off

Pressing the Save button will save these settings so that they become the default behavior the next time the page is launched.

Pressing the Defaults button will reset the stored settings to the original defaults the next time the page is launched.

The Close button ("X" in upper right corner) will return to the main Runtime Page.

The Report Tab brings up the following Report Setup screen:
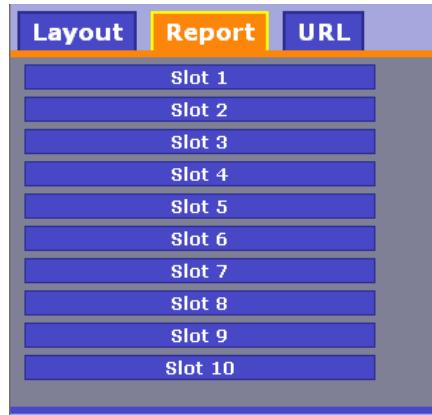
Data Values from datums in the selected inspection can be formatted and overlaid on the displayed image or shown in a table below the image. This is specified by assigning one of 10 data report slots. If overlayed on the image, each of these slots will represent a row in the display area, which is evenly split into 10 equal sized rows. The spacing will depend on the overall size of the display area, which in turn is dependant on the dimensions of the browser window. If the report is shown in list form, each slot corresponds to one of 10 rows.

Selecting a slot to configure results in the following display:
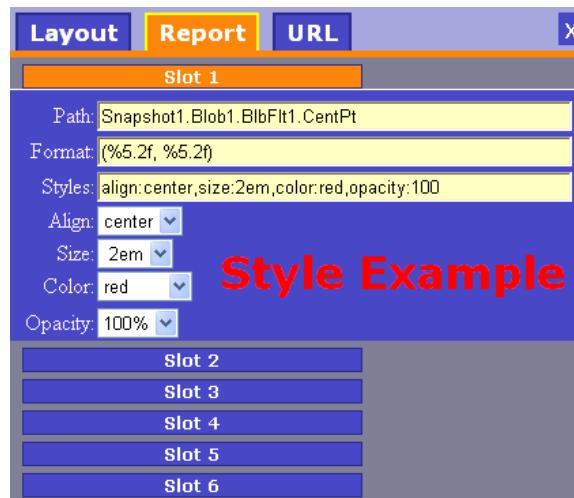
At a minimum the path to a datum must be specified. The inspection is implied, so it is not in the path. In the example above, the path Snapshot1.Blob1.BlbFlt1.CentPt is specified in the first slot.

This would display the value overlaid over the image near the top of the image display area. If D5 had been used instead, it would appear closer to the center.

By default, the displayed format will be appropriate for the datum type requested. However the format can be changed by specifying a printf style format string.

The format codes must be consistent with the expected data types. If the result is an integer, then a %d format is expected, floating point numbers require %f type formats. The list of format codes is not documented here, refer to printf documentation.

For array values, each element of the array will be passed in turn to the format string. For example, if a PointDm is being used, there are four expected array values corresponding to X, Y, angle, scale. (The order is the same as for variant access via VB). An example of using a format for PointDm:

(%.2f,%.2f) angle=%.1f scale=%.1f

This will display a result similar to:

(23.23,45.10) angle=3.2 scale=1.0

The later array values can be considered optional and can be omitted if desired. For example, to display just the x and y values of a PointDm, use the format string:

center = (%6.2f, %6.2f)

This will display a result similar to:

center = (134.22, 452.12)

If no format string is specified, an appropriate default format is used. For example, for a LineDm, by default the datum value will be displayed as:

A = value, B = value, C = value

Style

The default display of a report value is left justified, and uses a default font and color. If desired, all visual aspects of the displayed report value can be modified. If the Style field is used, it has the format:

style:value,style:value,…

For example, set the text size to 9pt, and align to the right, the following can be specified:

size:9pt,align:right

Possible style values:

Style Name	Values	Default	Comments
align	left, right, center	left	
size	CSS text size values (examples: 3em, 9pt, 22px)	9pt	
color	any named HTML color (red, blue, etc) or hexadecimal HTML color code (FF0000=red)	yellow	
opacity	number range 0..100	100	Setting this number to less than 100 will cause the displayed text to be translucent
CSS identifier	CSS values		

It is permitted to use CSS identifiers to alter other display aspects. For example, the following will show a red background color for the text:

backgroundColor:red

To set some of the more common styles, the combo boxes for Style, Size, Color, and Opacity can be used. The styles field will automatically be updated.

Selecting the URL tab brings up the following display:
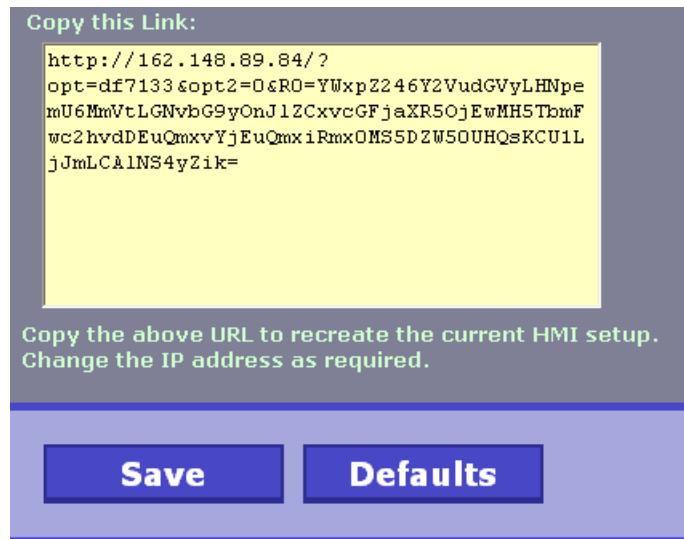
The displayed URL can be copied and then used in a browser window to completely replicate the current setup.

Additional Notes:

- Line breaks can be inserted into format strings by using embedded HTML codes. To introduce a line break, use "<br />"

- Commands and options are case sensitive. This is a limitation of javascript and CSS.

- A new Frontrunner feature allows copying a path of a datum to the clipboard. Right-click the Datum name in the DatumGrid display, and select the "Copy path to clipboard" option.

Appendix **D**   Web HMI